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EDITORIAL

Approaches to interaction--defining interaction, measuring/comparing interaction, increasing interaction--have long been the focus of considerable research activity in distance education. Many educators have concluded that higher levels of interaction between students and teacher result in enhanced learning. Authors Van Haalen and Miller report on a study which suggests that high levels of interaction, as measured by the number of telephone calls students make to the distant instructor, may not always correlate positively with increased learning in distance courses. In this applied science course, taught via satellite, moderation in student/teacher interactions appeared to coincide more directly with student success.

INTERACTIVITY AS A PREDICTOR OF STUDENT SUCCESS IN SATELLITE LEARNING PROGRAMS

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INTRODUCTION

Satellite distance learning programs were developed a number of years ago, primarily for business and university audiences (Siaciwena, 1989; Bruce, Katz and Tomsic, 1991; Coldeway, 1991). Since the mid-eighties, satellite courses developed for public school students in rural and

remote districts have also increased in number (U. S. Congress, OTA, 1989. Typically, students enrolling in these courses were those interested in fulfilling college entrance requirements, and would not be considered "at-risk" for school failure. With growing awareness of the skills that all Americans need to effectively function in the workplace (U. S. Department of Labor, 1991), diversity of distance learning courses has expanded to include technical preparation courses, as well.

Given the pioneering nature of many distance learning courses, research regarding effective practices and strategies is sketchy at best. However, key factors from traditional learning environments may also affect students learning at a distance. This study examines results of an innovative technical preparation course offered via satellite to students throughout a wide geographic area. Interactivity, a variable thought to be a key predictor of student success in traditional settings, is measured in relation to course grades.

BACKGROUND

Through the assistance of a large educational agency serving the Pacific Northwest, an applied physics course was offered via satellite to traditionally underserved students in that region. This course was developed by the Agency for Instructional Technology and the Center for Occupational Research and Development to address the learning needs of students who might otherwise be excluded from advanced science classes. This Principles of Technology course offered by the agency was an attempt to provide applied physics to students in remote areas as well as to students in more urban areas for whom non-traditional courses might be successful. This hands-on course was taught live, four days a week via satellite to students throughout a five-state area.

As needs arise for smaller and more remote schools to tap into the breadth of distance programs, the challenge remains to assess continuing student success and the factors contributing to their success (Willis, 1992). Ample research now exists reporting the importance of student-teacher interaction in the success of students in self-contained classrooms (Good and Grouws, 1979; Slavin, 1981). The use of correctives and feedback, for instance, allow students to monitor their own learning, adjust to delivery of new information, diagnose misunderstanding, and seek assistance. In short, teacher interaction with students may be as important as well-designed lessons.

Some researchers in distance programs have addressed the concept of differing types of interactivity. Moore (1989) for instance, refers to learner-content interaction, learner-instructor interaction and learner-learner interaction. Learner-content interaction refers to the learner's interaction with the program materials. Learner-instructor interactions include the instructor's ability to motivate students during class as well as direct contact between the student and the instructor.

The present study examines the effect of direct student-to-teacher interaction, via telephone, on student achievement in the distance learning situation. The research question generated from the emerging literature on distance education and research on teacher feedback became: does frequency of student call-ins to the course instructor

accurately predict success as measured by positive change in pre-to post-test scores?

METHODOLOGY

Subjects selected for this project included 41 high school juniors and seniors enrolled in Principles of Technology (PT) at each of 7 school sites throughout the narrow cast region. This course was taught throughout a five state area by an instructor who was instrumental in the development of the curriculum, had taught PT for five years, and had four years experience as a distance learning teacher.

To assess overall progress in the PT curriculum, a pretest was administered prior to the beginning of instruction. At the end of the school year, a post-test was administered with point gain used to measure overall progress for each of the 41 students. Telephone logs recorded the number of times students contacted the instructor during broadcast instruction and after broadcasts. Both the instructor and his teacher assistant maintained daily logs of all phone activities during the course of the school year.

A multiple regression analysis was conducted on the collected data, using student audio interaction with the instructor as the factor which would most significantly affect student performance gains. The JMP data analysis program (SAS Institute, 1989) was used to calculate a prediction equation to determine the magnitude of the correlation between the number of call-ins and gains in pre- to post-test scores.

RESULTS

The expected linear regression in which student pre- to post-test gains could be predicted by the number of student call-ins did not occur (R-squares for the prediction equaled .02). The R-square tells us how much the variation of test gain can be accounted for by the variation in student call-ins. When the confidence curve was determined using a polynomial equation, the results altered only slightly. This time the R-square for student call-ins indicated that only 14 percent of the variation in pre- to post-test gain could be explained by the frequency of student contact with the television instructor.

At this point, several "outliers" from one school site were noted in the descriptive statistics, possibly due to the late arrival of lab equipment at one particular site. After these scores were dropped from the analysis, the polynomial curve had an R-square of .46 ($p < .01$).

Examination of resultant data revealed a relationship of interest. The data displayed in a polynomial fit (inverted U) and indicated that students on either end of the sample (those who called very frequently and those who called infrequently) gained the fewest points from pre- to post-test. Total call-ins were recorded along the x-axis and overall course averages for each of the 21 subjects were recorded along the y-axis. Students who called very frequently (12-15 times per semester) or very infrequently (0-3 times per semester) obtained the lowest overall course averages. Those students whose number of calls to the course instructor fell within a mean range (4-11 calls per semester) gained the most in course scores.

CONCLUSIONS AND CLASSROOM IMPLICATIONS

Interactivity has long been perceived as an important variable in effective instruction. Lack of eye contact on the part of the course instructor in distance programs may contribute to a feeling of isolation on both the part of the instructor as well as that of the students. A key feature of the satellite educational program in this study is student access to a toll-free 800 number that relieves them from having to rely on incomplete information obtained from peers or classroom coordinators not versed in physics.

However, it appears that interactivity, as measured by the number of phone calls students make to the studio instructor, may not always correlate positively with student learning in distance courses. At least with this applied science course, moderation in student telephone interaction appeared to coincide more directly with student success. This result could be explained by the possibility that students who called infrequently, as expected, were not highly enough involved in the learning taking place over a distance.

An unexpected outcome of this study indicated however, that extremely frequent phone interaction did not predict a high level of involvement or student progress in this course. Possibly these students were calling because of their awareness that they were not succeeding at the desired level in the distance program. Most research on student-teacher interactions focuses on teacher behaviors, and a few have indicated non-linear relationships between what happens in the school and student achievement (Berliner, 1977; Soar and Soar, 1979). Results of this study indicate that non-linear relationships may also exist between student behaviors and student achievement, at least in some educational settings. For this reason, as more instructors move toward distance delivery of course content, they cannot assume that a high level of audio interactivity indicates a high level of student performance gain in the subject area.

These results have implications for the classroom coordinator and student at the distant location as well as for the course instructor. Reliance upon course materials, peer tutoring, and live broadcasts are probably equally as important as interaction over the telephone with course instructors. It seems likely that if any of these elements are missing or over emphasized in the learning equation, achievement gains will suffer. Further studies should investigate the magnitude that each of these factors carries in predicting student success in distance courses.

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